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ANTARCTIC EXPLORATION.

BY REAR-ADMIRAL A. H. MARKHAM R. N.

A YEAR ago it was my privilege to discuss in the pages of the NORTH AMERICAN REVIEW the North Polar Problem.

It will be my object in this article to treat briefly of the conditions appertaining to the opposite end of the world, namely, that immense unknown area in the southern hemisphere, immediately surrounding the South Pole, extending northward to the Antarctic Circle, and comprising an area of something like 8,000,000 square miles ; a region absolutely unknown and undiscovered. It seems scarcely credible that practically at the commencement of the twentieth century, when the forces of nature have, by the advancement of science, been brought so much under the domination of man, more especially when they are taken in connection with the facilities of modern travelling, so extensive an area should have remained unexplored and buried in obscurity.

It is, however, somewhat comforting to know that we now appear to be gradually awakening from the apathetic indifference with which we have hitherto been content to remain regarding our geographical knowledge, or rather ignorance, of this particular portion of the terrestrial globe, and are beginning to realize that it is not only desirable, but necessary in our own interests, as well as from a scientific point of view, to undertake a systematic exploration of the Antarctic regions.

On one occasion only has any really serious attempt been made to explore and investigate the regions situated to the south of the Antarctic Circle, and that attempt, incredible as it may appear, was made more than 50 years ago !

Nothing of importance has been undertaken since ; even the portals of this unknown area can hardly be said to have been ap-

proached during that time. Half a century is a long period, especially in this enterprising and adventurous age, when the ever restless and enthusiastic energies of the pioneers of civilization are leaving their indelible footprints over portions of the globe that fifty years ago were deemed almost inaccessible, for one particular part of the world to remain wrapt in the same impenetrable darkness that has surrounded it from time immemorial.

It is, therefore, time that we should arouse ourselves to the fact that Antarctic research is of vast scientific importance, and endorse the views of men of science on both sides of the Atlantic regarding the desirability of promoting Southern exploration.

Well may the question be asked, "How is it that so much money has been expended, so much time spent, and so many lives sacrificed in furthering our knowledge of the North Polar area, when its antipodes should remain unexplored and apparently uncared for?" The answer, however, is obvious. Our interest in the North was originally aroused, more than 300 years ago, when the prospect of discovering a short passage to India, China, and Japan was considered of the highest commercial importance, so as to avoid the long, tempestuous and, in those days, dangerous route round the Cape of Good Hope. The Arctic regions were practically at our own door, for they could be reached from European and American ports after a few days' sail—the Antarctic, on the other hand, was a long way off, and until the beginning of this century was far removed from any port or harbor that could be utilized as a base of operations. This objection has, however, been removed, for we now have commodious harbors and towns in New Zealand and Tasmania, just as capable of supplying necessities, and affording facilities of equipment, and as near to the Antarctic Circle, as are European and American ports to the Arctic regions. Then, again, it must be remembered that in consequence of so many expeditions having been despatched for the discovery of those northeast and northwest passages already alluded to, and also in search of those brave men who have been lost in their endeavors to unveil the hidden mysteries of the North, our interest in those regions has been more excited, and our desire to obtain further information more keen, and therefore our thoughts and attentions have been attracted northwards, and away from the Southern regions.

Now, however, the time has arrived when the question of Polar research in both hemispheres should be equally considered. There is still much to be done in the North, and so long as gallant explorers like Nansen, Jackson, and Peary continue to devote their energies in that direction, we shall not rest satisfied until the entire area of nearly a million and a half square miles has been faithfully delineated on our maps ; but it is an indisputable fact that there is much more than this to be done in the South, for there is more than seven times that extent of undiscovered area to be explored, and although the Antarctic Circle has been pierced in two or three places, our geographical knowledge of that region is not only extremely limited, but may be regarded as purely conjectural. In the Antarctic we have absolutely everything to learn !

The first attempt at Southern exploration was made more than a hundred years ago, when that famous seaman and celebrated navigator, Captain James Cook, was despatched from England with this object in view. His instructions were to endeavor to reach a large continent, which it was supposed existed, extending from the Pacific towards the South Pole, and which imaginative map makers and cartographers of the sixteenth century had depicted on their maps covered with mountains, lakes, and rivers. Cook never came across this vast southern continent, for the simple reason that it had no real existence, but his progress was baffled by huge fields of impenetrable ice, which effectually defied all his efforts to advance.*

The following entry in his journal clearly expresses his views on the subject. "I had now made the circuit of the Southern Ocean in a high latitude and travelled it in such a manner as to leave not the least room for the possibility of there being a continent unless near the pole and out of the reach of navigation. Thus I flatter myself, the southern hemisphere has been sufficiently explored, and a final end put to the searching after a southern continent which has at times engrossed the attention of some of the maritime powers for near two centuries past and been a favorite theory amongst the geographers of all ages."

The dangers attendant on the exploration of high southern

* Two years before Captain Cook's memorable voyage, *i. e.* in 1772, a French navigator, M. de Kerguelen, sighted high land in lat. 49° S. on the 69th meridian of E. longitude, which he somewhat hastily assumed was the long-talked-of southern continent, but on subsequent examination it proved to be an island which now bears his name.

latitudes were fully recognized by Cook, who writes, "that the risk run in exploring a coast in these unknown and icy seas is so very great that I can be bold enough to say that no man will ever venture further than I have done, and that the lands which may lie to the south will never be explored. Thick fogs, snow storms, intense cold, and every other thing that can render navigation dangerous must be encountered, and these difficulties are greatly heightened by the inexpressibly horrid aspect of the country, a country doomed by nature never once to feel the warmth of the sun's rays, but to lie buried in everlasting snow and ice."

Cook's predictions have not in this instance been verified, for already navigators have penetrated further to the south than he did, and the difficulties and dangers alluded to by him have not certainly been in excess of those encountered by explorers in the Arctic regions. Weddell, Ross, and Kristensen have all passed the extreme position attained by Captain Cook, but so far these are the only explorers who have succeeded in crossing the 70th parallel of south latitude.

The first named, an energetic sealing captain, while pursuing the avocations of his trade, in a small brig named the "Jane," actually succeeded in 1823 in passing the high position reached by Cook, and sailed three degrees further to the southward, but at some considerable distance to the eastward of the track of the great navigator. Unlike Captain Cook, who alluded to the "inexpressibly horrid aspect of the country," Weddell writes hopefully, a day or two before he reached his extreme southern position, that not a particle of ice was to be seen in any direction; that the weather was mild and serene, and the sea literally covered with birds! This, however, is only another instance of the uncertain and varied conditions of ice and sea in high latitudes at different periods.

In 1839, in consequence of urgent representations made to the British government by the Royal and other learned societies, it was decided to despatch a naval expedition with the object of prosecuting scientific researches, more especially with reference to observations in territorial magnetism, in the Antarctic regions. The command of the expedition was entrusted to Captain Sir James Clark Ross, a skilful sailor, an experienced navigator, and a man of great scientific attainments. He had already earned a deservedly high reputation as an explorer by his discovery of the North

Magnetic Pole, after enduring great hardships and privations, during an enforced residence of over four years on the barren and sterile shores of Boothia Felix. No man could have been selected better qualified for the command of such an enterprise, and the result conclusively proved the wisdom of the selection. The ships placed under his command were the "Erebus" and "Terror," the identical vessels that six years later sailed from England under Sir John Franklin on his last, ill-fated expedition.

Ross sailed in September, 1839, and reached Tasmania the following August, where he heard for the first time of the discoveries of Wilkes and D'Urville, but neither of these explorers had succeeded in penetrating beyond the 70th parallel of latitude; but then it must not be forgotten that their ships were in no way adapted for ice navigation. For three years did Ross persist in his endeavors to penetrate the ice, on various meridians of longitude, with the view of reaching a high latitude, and with such success that he had the satisfaction of carrying his clumsy bluff bowed old ships to latitude 75 degrees 3 minutes in about the longitude of New Zealand.

In order to attain this high position he had sailed for more than 300 miles in an east and west direction, along an absolutely impassable barrier of ice, rising like a great perpendicular cliff to a height in some places of over 200 feet above the level of the sea, and sinking to a depth of over 1,000 feet below. From his highest position land was observed stretching away to the eastward, a range of stupendous mountains rising in many peaks, and culminating in two high mountains of an estimated altitude of 15,000 and 10,000 feet, to which the names were given, respectively, of Mounts Terror and Erebus. Both were evidently of volcanic origin, and from one dense columns of smoke intermingled with incessant flashes of flame were observed. To the large tract of land on which these mountains were situated, was given the name of Victoria Land, after Her Most Gracious Majesty the Queen of England. Numerous glaciers of gigantic dimensions were seen filling up the broad spaces between the hills, and projecting several miles into the sea. It was a great disappointment to Sir James Ross and his companions that they were unable to make a closer inspection of this apparently vast continent, but all attempts at landing were frustrated by the enormous masses of ice that lay between them and the land, and

they were reluctantly compelled to abandon an enterprise so fraught with interest, and return home.

As an instance of the varying manner in which the peculiarities of a country strike different observers, it may be remarked that whereas Captain Cook, a very correct and shrewd observer, condemned the country, weather, etc., in unmistakable language, Sir James Ross writes that "on some days the sun shone forth with great brilliancy from a perfectly serene and clear sky of a most intense indigo blue, and the members of the expedition gazed with feelings of indescribable delight upon a scene of grandeur and magnificence beyond anything they had ever before seen or could have conceived."

The expedition was productive of much useful and valuable scientific knowledge, more especially with regard to the physical and biological conditions of the Antarctic regions, while the position of the South Magnetic Pole was approximately determined to be about 150 miles to the southeast of Mount Erebus. No other expedition, equipped on the same elaborate scale, has been despatched for the purpose of exploring those interesting regions since the return of Sir James Ross. It is very true that H. M. S. "*Challenger*," while engaged on her scientific and interesting voyage round the world, crossed the Antarctic Circle, but it was no part of her duty to penetrate into the unknown area, more especially as she was not constructed for the purpose of navigating ice-clad seas, but she materially added to our knowledge of high southern latitudes during her eventful cruise.

When we reflect on the amount of interesting work that was accomplished by Sir James Ross in his old cumbrous, dull sailing ships, more than half a century ago, we may safely assume that a couple of well-found steamers, competently commanded, and replete with all modern requirements, would reap a more abundant scientific harvest in the course of one navigable season, than was achieved by Ross during the three years he was engaged in his interesting exploration of the South Polar regions. As a verification of this assumption, I will take as an illustration the recent voyage made by the whaler "*Antarctic*," practically the first steamer, specially constructed for ice navigation, that has attempted to penetrate for any distance the ice fields of the South.

This vessel, under the command of Captain Kristensen, left

Melbourne, in Australia, on the 28th of September, 1894, fully equipped for a whaling and sealing voyage ; but it was arranged that in prosecuting the commercial part of the enterprise, they would also use their utmost endeavors to promote geographical research by attempting to reach Ross's great continent, and, if possible, even a higher latitude. After a brief stay in Tasmania the Antarctic Circle was crossed on Christmas Day, and ten days afterwards they entered the main body of the ice in latitude 67 degrees on the 125th meridian of east longitude.

In another ten days they succeeded in working their way through the pack for about 200 miles in a southerly direction, when they reached open water.

In this large expanse of water many whales were seen, but unfortunately they were not of the right sort for commerce, and were therefore not molested. Continuing to push their way to the southward, they reached the latitude of 74 degrees 10 minutes and 173 degrees east longitude, on the 22d of January, only four weeks after they had crossed the Antarctic circle. This was undoubtedly a great achievement, clearly proving the advantages that steam possesses over sails as a motive power in a ship engaged in ice navigation. During the voyage they succeeded in effecting a landing on the great Southern continent in the neighborhood of Cape Adare, and thus had the extreme gratification and honor of being the first human beings that had ever set foot on Victoria Land.

A large collection of geological and other specimens were made, with which rich and interesting harvest the "Antarctic" returned to Melbourne, reaching that port on the 12th of March, after an absence only of five and a half months.

This cruise of the little "Antarctic," so bravely and so skillfully conducted, as a pioneer voyage of discovery in the high latitudes of the Southern hemisphere, must always be regarded as of the highest interest and importance, as showing what can be done by a well-found steamer competently commanded.

The time is now ripe for a prosecution of Antarctic research, and it should be carried out on a scale equal to that governing the expedition which was despatched under the command of Sir James Ross more than fifty years ago, when the gain to science that would result would, I feel assured, be of far greater value and interest now than it was half a century ago.

I have already said our knowledge of the Antarctic regions is extremely limited. The fauna of that large Southern continent is absolutely unknown; no land animals have ever been seen there, nor have any traces of vegetation been discovered, except, I believe, a few moss specimens and a lichen that were gathered by Captain Kristensen in the neighborhood of Cape Adare. So far as we know at present, the land is barren and sterile beyond conception. On the other hand, the fauna of the Antarctic sea is immensely rich, and is reported to be by Dr. John Murray "apparently more abundant and more peculiar than in any other region of the ocean's bed." Further investigations in the South Polar regions would be of the greatest value as enabling us to obtain a knowledge relative to hitherto unsolved problems in the science of oceanography.

Geography, and its closely allied sister, Geology, would be essentially benefited by further research. The possible extent of what is known to be a vast tract of country would, perhaps, be ascertained. The nature of the formation of its rocks would be determined, and possibly rich fossiliferous deposits found. More volcanic mountains may be discovered. The extent and depth of the ice cap, which has been seen by all navigators that have penetrated far South, would probably be satisfactorily determined. Pendulum observations, and others bearing on terrestrial magnetism in a high Southern latitude, would be of the greatest value and importance.

Professor Neumayer, than whom there is no higher authority, says "that without an examination and a survey of the magnetic properties of the Antarctic regions, it is utterly hopeless to strive with prospects of success at the advancement of the theory of the earth's magnetism."

In a report drawn up by a committee of the Royal Society of London, the importance of further researches into the question of terrestrial magnetism is very strongly urged. It says that "while many branches of science will benefit by observations in this Southern region, it is more especially the requirements of magnetism which have forced themselves upon the notice of your committee, and there can be no doubt that an exploring expedition is urgently needed to add to our knowledge in this branch of science." In continuation, the report points out that in calculating the magnetic state of the whole surface of the earth, it is ab-

absolutely indispensable that the calculation should be checked by observations made in high Southern latitudes. It is further stated that while our knowledge of the position of the North Magnetic Pole has been determined, that of the South Magnetic Pole is not known to within about a hundred miles. In order to determine its position, it is not absolutely necessary to reach that spot, but it can be fairly well fixed by calculation, if accurate observations of the magnetic inclination were made in various positions in high Southern latitudes.

Looking at the necessity of the renewal of Antarctic research from a practical standpoint, I will mention one particular reason which will, I think, suffice to illustrate the desirability, nay, the necessity, of obtaining further information regarding the phenomena of terrestrial magnetism.

The days of old wooden sailing ships are numbered, and their place has been taken by large swift steamers, which carry valuable cargoes of human freight and rich merchandise to all parts of the world. An accurate knowledge of the variation of the compass, especially in those regions where fogs are prevalent, and where the sun is frequently obscured for several successive days, will enable a direct course to be steered with confidence, materially diminishing the distance that would otherwise probably have to be traversed, and thus ensure a perceptible saving of time, which, it is hardly necessary to say, means money. This is especially applicable to vessels constructed of iron or steel. The change of magnetic declination in the Southern hemisphere, especially along those great trade routes to the Cape of Good Hope, Australia and New Zealand, is known to be very great, but the *exact* change is unknown, and can only be correctly ascertained by a series of systematic observations taken in high Southern latitudes.

A perfect knowledge of the conditions of the ice is also of very great interest. The icebergs met with in the Southern regions differ very materially in size and shape from those seen in the North. They are of a uniform tabular topped shape, with steep precipitous sides and many of them of enormous bulk and length. They are, it may reasonably be inferred, fragments from that immense ice barrier along which Ross sailed for a distance of over 300 miles, and which stretched away to the southward like a vast and interminable sea of ice.

Captain Kristensen reports having seen one of these huge bergs, which he estimated at over 50 miles in length, and which, at first, was mistaken for an island and actually named after the promoter of his enterprise. This is not to be wondered at, for we know that many of these bergs have been frequently seen so discolored as to be easily mistaken at a distance for land. This discoloration is due to the presence of mud, clay, gravel and stones, and even large boulders of red sandstone and basalt have been seen on them, sure indications of land to the southward.

It is almost superfluous to add that the science of meteorology would be greatly promoted by the despatch of an Antarctic expedition. The assertion that our knowledge of meteorology must be considered as absolutely incomplete until we have continuous observations recorded during a period of two or more consecutive years in high Southern latitudes is very true, and these observations would add very materially to our knowledge of the effect that results from the changes of climate over large areas of ice covered seas.

And, finally, writing as a naval officer and one who has seen considerable service in the regions of "thick ribb'd ice," I cannot help expressing a very decided opinion that, apart from the valuable scientific information that must necessarily accrue from a naval Antarctic exploring expedition, fitted out and despatched under the auspices of government, the very fact of employing officers and men during peace time, on a service which essentially demands from them all the pluck, energy, and resources and other qualities that are so highly valuable in war time, cannot but be of the greatest importance to that nation which employs her navy on such a laudable and patriotic service.

I will conclude with the following extract from a speech recently delivered by the Duke of Argyll on the subject of Antarctic exploration: "I confess I feel an immense interest in the question of an Antarctic expedition. I always feel a little shame that civilized man, living on his own little planet, a very small globe, should, in this nineteenth century of the Christian Era, not yet have explored the whole of this little area; it seems a reproach on the enterprise, civilization, and condition of knowledge of the human race."

And in these admirable sentiments I cordially concur.

A. H. MARKHAM.